DRAFT 8/28/06

Geomorphology (Geol/Geog 320). Fall, 2006.

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Geomorphology is the study of landforms and landscapes and the processes that have shaped them. It is a basic science, driven in part by curiosity about the landscapes in which we live and the distinctive landforms that occur within them. Geomorphology also has important practical applications, however, and is essential to understanding many natural hazards and many forms of environmental change. An understanding of geomorphic processes is directly relevant to fields such as geotechnical and environmental engineering, sedimentology, soil science, and archaeology. Modern geomorphology is often highly quantitative, but direct observation of processes and landforms in the field is still an essential component of geomorphological research.

In this course, we will generally follow a sequence from *process* to *form*, starting with an in-depth look at a particular group of geomorphic processes, followed by discussion of the landforms those processes create and their importance in interpreting long-term landscape development.

Prerequisites. One of the following: Geol 100, 101, 106, 109 or Geog 120, 127. Familiarity with concepts and terminology covered in those courses is assumed.

Field Trips: Two one-day, Saturday field trips are required, on Sept. 30 and Oct. 21. *Be ready to leave from **Weeks Hall** at 8 AM, both days.* Bring a lunch and be prepared for the weather. If you have an unavoidable scheduling contact with either field trip, *let me know early in the semester*.

Lab: Lab exercises provide experience with basic tools used in geomorphology. These include a) field observations and measurements, b) interpretation of landforms and landscapes from maps, remotely sensed images, and digital elevation models, and c) use of simple numerical models of geomorphic processes. *The lab grade also includes exercises completed during field trips, or with data collected on the field trips.* Because of the Labor Day holiday, the first lab sessions will be on September 12. The TA will provide a schedule of lab exercises.

Required readings will be placed on reserve in the Geography and Geology libraries (and made available on line whenever possible). You are responsible for material covered in these required readings, and at least a few exam or quiz questions will be drawn from them. The following **textbook** is **recommended, but not required.** *Surface processes and landforms, 2nd Edition*, by Don Easterbrook (Prentice Hall, ISBN 0-13-860958-6). The text by Easterbrook is intended to give you more background on topics covered in lecture, and it includes a significant amount of material not covered in lecture or on exams.

Grading. There will be **one quiz and three exams** during the semester, given during regular lecture periods. There will *not* be a final exam during finals week. The course grade will be based on the exams and quiz (75% total), and the final lab grade (25%). There is no extra credit. If unavoidable circumstances prevent you from taking an exam, discuss this with the instructor beforehand, if at all possible, or immediately afterward. Make-up work can only be arranged if this is done in a timely fashion.

Exam format will be a mixture of multiple choice, short answer, and short essay questions. The quiz will be similar but shorter. Exam and quiz questions will deal with topics covered in lecture, with a few questions also drawn from required readings. For the second and third exam, part of your grade may be based on a ***take-home essay question***, handed out during the exam and due one week later.

Course Topics and Reading Assignments. "Easterbrook" refers to the recommended text book.

9/5. Introduction to the course. Overview of geomorphology. Driving and resisting forces, types of equilibrium, and thresholds. *Required reading, on reserve:* Ritter et al., *Process Geomorphology*, 4th Ed., Chapter 1 (the discussion of rock composition on page 10 can be skipped).

9/7, 9/12. Dating methods used in geomorphology: Radiocarbon, luminescence, cosmogenic nuclides. *Recommended reading, from Easterbrook:*pages 495 through 500, p. 502 (starting with "Cosmogenic Isotope Dating") through 504.

9/14. Glacial processes, part 1: Types of glaciers, mass balance of glaciers, and ice flow. *Recommended reading, from Easterbrook:* pages 294-314.

9/19. Quiz (first part of class period)

9/19, 9/21. Glacial processes, part 2: Glacial erosion, sediment transport, and deposition. *Recommended reading, from Easterbrook:* pages 314-326.

9/26, 9/28, 10/3. Glacial landforms and glaciated landscapes. *Required reading, on reserve:* Dott and Attig, *Roadside Geology of Wisconsin*, pages 21 through 28. *Recommended reading, from Easterbrook:* Chapter 13. *For more background* (much of this won't be covered in class or on exams) read Chapter 14 in Easterbrook as well.

9/30 (Saturday) Field Trip 1. 8AM to 5PM.

10/5. Weathering and soils. *Required reading, on reserve:* Schaetzl and Anderson, *Soils: Genesis and Geomorphology*, pages 32 through 40 (You are responsible for knowing the master horizon definitions covered in Table 3.1; look over Table 3.2 and Figure 3.5, but you are *not* responsible for the detailed information present there); *Recommended reading, from Easterbrook:* Chapter 3.

10/10. Exam 1.

10/12, 10/17 Hillslope processes, part 1. Mass wasting. *Recommended reading, from Easterbrook:* Chapter 4, through page 87.

10/19, 10/24. Hillslope processes, part 2. Runoff, rainsplash, slopewash and creep. Hillslope form. *Required readings, on reserve: **1)*** Dunne and Leopold, *Water in Environmental Planning*, pages 255 through 274; ***2)*** Gilbert, *Geology of the Henry Mountains,* pages 99 through 105.

10/21 (Saturday) Field Trip 1. 8AM to 5PM.

10/26, 10/31. Fluvial processes, part 1: Discharge and the hydrograph. Floods and flood frequency. Channel initiation, and drainage network development. Drainage basin characteristics, flood hydrology, and sediment yield. *Recommended reading, from Easterbrook:* pages 97 through 107; 145 through 154.

11/2, 11/7. Fluvial processes, part 2: In-channel flow, sediment transport, bedforms, and channel patterns. *Recommended reading, from Easterbrook:* pages 114 (starting with "Flow Velocity") through 130.

11/9. Exam 2.

11/14, 11/16. Floodplains, aggradation and incision, terraces, response of the alluvial system to climate change and tectonics. *Required reading, on reserve:* Gilbert, *Geology of the Henry Mountains,* page 124 (starting at "The Stability of Drainage Lines") through page 133 [*start reading this now; it will also apply to the topic of fans and pediments*]. *Recommended reading, from Easterbrook:* p. 130 (starting with "Equilibrium in Streams") through 137 (I will point out in a lecture a few points on which I disagree with this part of Easterbrook's text); 172 (starting with "Cyclic Stream Terraces…") through 181.

11/21. Alluvial fans and pediments. *Recommended reading, from Easterbrook:* p. 156 (starting with "Pediments") through 166 (deltas will be discussed later).

11/28, 11/30. Coastal processes and landforms. *Recommended reading, from Easterbrook:* Chapter 16.

12/5, 12/7. Eolian processes and landforms. *Required reading, on reserve:* Ritter et al., *Process Geomorphology*, Chapter 8.

12/12. Summing up, and review.

12/14. Exam 3.